Improvement of the Ohio River.

Rooms of the Pittsburgh Board of Trade,
January 4, 1856.

At a meeting of the Board this day, the following communication was read. After a discussion of the views of the writer, it was ordered that it be published in the papers of the city, and also in pamphlet form, with the former pamphlet by the same writer appended.

Gentlemen: In a communication which I had the honor to make to your Board in March last, and which you were pleased to publish in pamphlet form (a copy of which is hereunto appended to obviate repetition,) I ventured to point out particularly, and somewhat fully, the mode of improving the Ohio River, so as to render it as reliable and as perfect a channel of communication as it is practicable to make it. In doing so, I offered nothing novel, nor suggested any untried experiments, but simply followed the lights of safe and successful experience; pointing to the Monongahela slackwater as a model—perhaps to be improved upon a little, but still a model—which it would be safe and expedient to follow in the magnificent enterprise you have in contemplation. I pointed to that modest improvement, of which the world hears but little, but which is nevertheless a noble monument of the enterprise of your city, and is silently and unobtrusively shedding its benefits not only upon your city, but upon the entire valley of the Ohio, and has converted the shores of the Monongahela almost into one continuous village.

The year 1854 was one of unexampled drought. Never before was the necessity of the contemplated improvement more keenly or painfully felt. Your warehouses groaned under the weight of accumulated stocks, while the industry of the city languished for want of its indispensable stimulus, money. Men of enterprise found it extremely difficult to bear up under the constantly increasing weight of their responsibilities, while the poor were reduced to utter poverty, and many were for the first time — and may we not hope for the last?—compelled to ask alms of their more favored brethren. The hearts of all sickened with hope deferred, while

looking and longing day after day, and week after week, for water. These calamities—and surely the distress occasioned by so serious an interruption in the customary business of a great community, warrants the use of that strong word—these calamities inspired an earnest and wide spread desire for an improvement of this great river, upon which we find we are so dependent, so as to render it a permanent and reliable avenue of commerce. Your Board was among the first to act; and now you are able to congratulate your immediate fellow-citizens and the country at large upon the fact that the good work is begun; that the necessary legislation on the part of Pennsylvania has been obtained, and that the books for the subscription of stock are opened. I am happy, moreover, in being able to state that the good, old, well-tried mode of improving the river by a system of Dams and Locks, as advocated in my former communication, is the one that meets with almost unanimous approval; and that there is a good prospect that that important question will be speedily and satisfactorily settled.

It is remarkable that the dry year of 1854 should be immediately followed by one that will be long remembered for its opposite character. Frequent and copious rains have kept the river sufficiently full for good navigation for ten consecutive months. Pittsburgh has consequently had a season of steady, uninterrupted prosperity: and an amount of commerce has floated upon the Ohio river far beyond all precedent. I have not the statistics before me; but I have often visited your levee during the past season, and witnessed the busy scenes there. One fact alone affords a stronger argument in support of the policy of rendering the Ohio permanently navigable, than volumes of abstract reasoning could do: it is, that the increase of receipts of the Pennsylvania Central Railroad for 1855, over those of 1854 was *eight hundred thousand dollars.* This enormous advance is almost solely attributable to the fact that the Ohio was permanently navigable during the past season. If one single interest was benefitted to such an extent, it surely would not be an extravagant estimate to set down the aggregate value of the benefits arising from the unexampled navigation of 1855 at an amount sufficient to improve the entire river in the mode proposed—say ten millions of dollars. Such seasons as the two last are equally unusual. So severe a drought as that of 1854 may not occur again for a century; neither may such copious and frequent rains as those of 1855 be experienced in the lifetime of any now living. The one taught us the inestimable value of this river, by its failure to afford its wonted facilities; the other showed us what could be done upon it, were those facilities uninterupted. True, many thousands of tons of merchandise were doubtless sent through other channels, which would have been sent by this river, but for fear of its

ordinary periodical failure; still enough has been realized to afford some idea of the vastness of its trade, were it rendered permanently navigable.

In the discussion of so gigantic and far reaching an enterprise, many and diverse elements enter into the question of profit and loss. Assuming the cost of the work at ten millions, and that is probably high enough; for it gives $200,000 for each Dam with its accompanying Locks,—we must set that sum down on the *debit* side, and then cast about for items to set on the opposite side.

1. *Tolls.*—These ought to be very low—so low as scarcely to be felt as a tax upon the commeree of the river; yet so enormous is, or rather will be, that commerce, that the aggregate sum realized, will be sufficient to keep the work in repair, defray working expenses, and pay satisfactory dividends to the stockholders. The Monongahela Navigation Company, with nothing but a local trade, and with a tarriff of rates so low as to silence all complaint, divided in 1854 nine per cent. During the past year the company have been engaged in constructing two additional Dams and Locks, which will extend their work 28 miles above Brownsville. The nett earnings for 1855 were more than ten per cent. upon the cost of the finished portion of the work; but owing to a large increase of stock upon which dividends were paid, issued on account of the above mentioned extension, the declared dividends were only eight per cent.; but a reserve of more than one per cent. was retained. This is safe and good data upon which to proceed.

2d. *Water Power.*—This is an item upon which little or nothing has been said; but it is one of incalculable importance. Each dam will raise the water in the pool above from 8 to 9 feet higher than that in the pool below—a good working fall. As to the quantity of surplus water, all that need be said about it is, that there will be more than ever can be used. Between Pittsburgh and Cincinnati, this surplus water may be used *thirty-three* times, that being the number of dams required to overcome the fall in those 462 miles. At every dam a canal may be carried along the margin of the pool below, of any desired length, and the water let out at stipulated rates to all who may choose to use it, as is done with the water of the Schuylkill, at Manayunk, near Philadelphia. When we reflect upon the great length of the river, the fertility and wealth of the region through which it flows, together with the fact that this power is in the best possible locations for the enjoyment of commercial facilities, it must strike every mind that here is an interest *created* of very great value—one that will go far towards remunerating the stockholders for their outlay, as well as add immensely both to the trade of the river, and the general prosperity and well-being of the country.

3. *Advantages to Individual Enterprise, and Enhancement of the value of Real Estate.*—I have heard it estimated that were the property-holders, manufacturers and business men of Pittsburgh to do the entire work themselves, they would make money by the operation, so great would be the effect upon their business and property. This may be an exaggerated view; but certainly the effect of this improvement upon this city would be very important. To Cincinnati, its collateral value would be greater still; for unless the relative importance of the Ohio river can be maintained as an avenue of trade, that city is in danger of losing her commercial supremacy in the great region of which she is now the centre. The railroads to the north of her will draw off no small amount of the trade which has made her what she is, unless the navigation of the Ohio can be so improved as to countervail the effect of its powerful artificial rivals, and be restored to its long standing, but now endangered supremacy. And what is true of Cincinnati, is more or less true of every city and town on the river.

But the cities are not alone interested. The entire region through which the river flows would be greatly enhanced in value by the proposed improvement. Let any one look at the valley of the Monongahela who wishes to see the advantages of such an improvement as the one in contemplation. The Ohio is, in round numbers, one thousand miles long. Let us assume that the value of land on each side, to the distance of ten miles, will be enhanced to an average amount of one dollar per acre, it would amount to an aggregate enhancement of $12,800,000.

4. *Effect upon the value of Railroad Stock.*—We have already seen that the increase of this year's receipts on the Pennsylvania Railroad were $800,000 over last year. Give this uninterrupted navigation of the Ohio during the past season credit for two-thirds of that increase, and we have $533,000, being almost equal to six per cent. interest on the estimated cost of the proposed improvement. Add to this the effect upon the Baltimore and Ohio Road, the Connellsville Road, the Allegheny Valley Road, and in short all the roads that have been made or can be made between this river and the seaboard, and we perceive that it is great enough to render it good policy in those companies to make the improvement themselves, provided it could not otherwise be accomplished; for they may rest assured, that were the river rendered permanently navigable in the manner proposed, it would carry more freight to their western termini than they will be able to carry away; and bear off from them more than they can bring.

5. *A Donation from Government.*—At least two-thirds of the American people are interested in the navigation of the Ohio. Its improvement, therefore, is truly a national work, and as such, the company having it in charge may confidently ask of Congress a donation equal at least

to one-third of the cost of the work. This would have the effect of inspiring confidence, and ultimately of lowering the tolls without affecting the dividends.

If judiciously managed in its construction and working, this improvement cannot fail to be a profitable enterprise to the stockholders. Its cost will be only about one half that of an ordinary canal of equal length, while its capacity will be at least ten-fold. It will unquestionably be crowded with business. How then can it fail to pay, even though its rates of charges should be only one-tenth the amount of those assessed upon the New York and Erie canal? On that canal one lockage will pass say forty tons, while on the Ohio, one lockage will pass five hundred tons. This is where the vast advantage of this navigation will lie; and this is what will cause very low rates of charges to roll up a large aggregate revenue. To this may be added the revenues arising from the leases of water power; and together they can hardly fail to render the stock amongst the best in the country.

It would perhaps be well to limit the dividends arising from tolls; but let those arising from the lease of water privileges be unlimited. To that end, separate and distinct accounts should be kept. The more leases the company can dispose of the better for themselves, and the better for the country.

In view of these facts and considerations, may we not confidently hope that the required amount of stock will be taken as soon as the necessary legislation in Virginia, Ohio, Kentucky, Indiana and Illinois can be obtained, and the work pressed to completion as rapidly as a proper regard for efficiency and permanence will warrant.

The commencement and prosecution of this enterprise is now acknowledged on all hands to be highly *expedient*; but should it be deferred for the present, ten years will not elapse before it will be felt to be a *necessity*, absolutely indispensable to the continued prosperity and relative standing of these river cities, and equally so to the commerce of the country. It is only a question of time; and to put it off for a few years may cost the great manufacturing and mercantile communities located on its banks five fold more in the loss of business than would be required to construct it in the most solid and durable manner. And, after suffering that loss, after demonstrating by very costly experience the indispensable necessity of the work, they would be obliged, by the sheer force of circumstances, to undertake it and carry it through. How much better to undertake it at once, and push it forward vigorously; for be assured that nothing would so enhance the value of property, stimulate business, attract capital, and cause universal prosperity, as the

certain prospect that in three or four years the Ohio river should be rendered permanently navigable.

To you, gentlemen, belongs the honor of taking the lead in this grand enterprise; and no city in the Union is more deeply interested in it than yours. You have enjoyed great and long continued prosperity, and you owe no small part of your great success to this noble river. To render it still more perfect; to keep it up with the wonderful progress of the age; to enable it to maintain its ancient supremacy as the great central thoroughfare of the country, it demands from those it has enriched a comparatively small expenditure—an amount so small, when compared with the immense interests to be affected, and with the number and wealth of the people whose welfare is to be promoted by it, that its payment will never be felt. Twenty millions of people are interested in it, and but ten millions of dollars are required. Indeed it is difficult to realize the easy nature of the enterprise, or that so magnificent a work can be accomplished at so small an expense. The task you have undertaken is a glorious one, but it cannot be difficult.

Very respectfully yours, &c.,

JOSIAH COPLEY.

Armstrong County, Jan 1, 1856.

Mr. COPLEY'S COMMUNICATION OF MARCH LAST.

REFERRED TO IN THE PRECEDING ARTICLE.

March 23, 1855.

The following article, prepared by a gentleman formerly of this city, but now residing in a neighboring county, was read at the last meeting of the Directors of the Board of Trade, and attracted the favorable attention of that body.

This paper was considered by the Board as embodying many valuable ideas, on a subject that must receive a rapidly increasing share of public interest. The thanks of the Directors were unanimously tendered to the writer, and the publication of the paper was authorized, and its views earnestly commended to public consideration.

I wish to offer a few thoughts upon the subject of the proposed Improvement of the Ohio River.

There is no avenue of internal commerce in the United States, or perhaps in the world, in which so large a number of people are interested, as the Ohio River, whether we regard it in reference to its length, its central position, the vast productiveness of the region it traverses, both in the fruits of the soil and the products of its mines, or in view of the numerous railroads that connect it with all the great Atlantic cities, together with its natural connection with the great rivers through which its commerce may flow, without interruption or transhipment, to every part of the valley of the Mississippi. To render such a river permanently navigable, so that its commerce may not be subjected to those periodical interruptions to which it is now liable, is a work worthy of the best exertions of a great, wealthy and growing people. So vast is the exchange of commodities effected in whole or in part through the medium of this river, that at least ten millions of the American people are directly interested in it; and the interests or more than eighteen millions would be favorably affected by any improvement that would render it a more reliable channel of trade. If, therefore, any work may be called NATIONAL, this is the one.

Already, in its natural, unimproved condition, the tonnage of the Ohio is immeasurably beyond the capacity of all the rail roads that traverse the Middle and Western States from East to West; and to keep pace with its regular increase would require an annual addition of one road to those already existing. On the score of economy, it is well known that freights on the river are far below the very lowest paying rates by rail road. It is not the object of the writer of this article to give a statistical detail of the trade of the Ohio. This has recently been done in the interesting and important memorial of the Board of Trade of Pittsburgh. They have well stated the amount of business done on this river; but neither they nor any other men can estimate the amount of loss occasioned by the frequent and long interruptions of its navigation from want of water. Could these be prevented, the trade of the river would soon be vastly augmented, and the interchange of commodities be carried on with steadiness and regularity, to the great benefit of all concerned.

From Pittsburgh to the mouth of the Ohio, is stated by the best authorities, to be 977 miles, with an aggregate fall of 425 feet, divided as follows:

	Miles.	Fall in feet.	Av. fall per mile, in inches.
Pittsburgh to Wheeling, -	88	79	10.77
Wheeling to Cincinnati,	374	188	6
Cincinnati to Louisville	156	55	4.2
Louisville to Portland, (falls,)	3	25	100
Portland to Evansville,	169	33	2.85
Evansville to Cairo,	187	45	2.9
Aggregate,	977	425	

To convert the entire river into slack water, would require only fifty locks, or pairs of locks, of an average lift of 8½ feet, which would create pools of an average length of—

Between Pittsburgh and Wheeling, - -	10 miles.
" Wheeling and Cincinnati, - - -	17 "
" Cincinnati and Louisville, - -	25 "
" Louisville and Portland, (falls,) - -	1 "
" Portland and Evansville, - - -	42 "
" Evansville and Cairo, - - - -	37 "

The average fall of the river from Pittsburgh to Cairo is a small fraction over 44-100 of a foot to the mile, There are few canals in the world, of any considerable length, with so small an amount of lockage, in proportion to their length. From Pittsburgh to Johnstown, on the

Pennsylvania Canal, 105 miles, the lockage is upwards of 430 feet, being ten times greater, in proportion to the distance, than will be required on the Ohio river. These facts cannot be too distinctly or emphatically set forth.

THE DAMS AND POOLS.

At the lowest stage of water there ought not to be less than five feet in the navigable channel at the upper ends of the pools; nor ought the lift from one pool to the other to be more than eight to nine feet. This would require the dams to be from 11 to 12 feet high from their foundations, and would cause the water of the pools to rise about two or three feet upon the dams immediately above, thus obviating, to a great degree the necessity for excavations below the locks. This would give a series of deep pools, affording a safe and easy navigation for the largest steam boats, and the heaviest barges.

I have said that the lift from pool to pool ought not to exceed eight or nine feet. Less than this would be to multiply dams and locks unnecessarily—more would add to the heighth of the water during high freshets, and cause the river to overflow its banks more than it now does. A rise of water equal to sixteen feet in the natural channel of the river, would restore the inclined plane corresponding to the natural fall of the river, and cause the water to flow on a level over the crest of the dams, except a slight depression or trough just below the dams, caused by the accelerated movement of the water over them. When that is the case, the heighth of the flood is no greater in consequence of the dams. *The inclined plane being restored, the volume of water in the river is urged forward with all the velocity due to the natural fall of the river, be it six feet or six inches to the mile.* The dams occasion a momentary acceleration in the current and nothing more. This is sound theory; and experience, in thousands of instances, has attested its soundness. All fears, therefore, of an increase of the disastrous effects of high floods, in consequence of such dams, may be dismissed as groundless.

LOCKS.

The Ohio river, so deepened and slackened, would be converted into the most stupendous and capacious canal in the world. Forming, as it does, the principal link in the chain of communication between the Atlantic States and the Great West, and traversing, as it does, a thousand miles of country of unsurpassed fertility and productiveness, it would be folly to attempt to assign limits to the amount of tonnage that would float upon its bosom. Certainly nothing less than double locks ought to be thought of; and they ought to be of sufficient capacity to admit of

steam boats of the largest class, or six coal barges. These locks need not be raised more than 16 feet above low water; for before the river should rise high enough to overflow locks of that heighth, the dams would cease to offer any obstruction to navigation.

ECONOMY OF PROPELLING POWER.

The resistance offered by water to vessels moving through it, is in the ratio of the squares of their velocity. Thus, if it requires the power of one horse to move a boat one mile per hour through still water, it will require the power of four horses to move it two miles per hour, and so on. But we will put it in tabular form.

1	mile per hour, the power of					- - -	1 horse.
2	miles	"	"	"	"	- - - - -	4 horses.
4	"	"	"	"	"	- - -	16 "
8	"	"	"	"	"	- - - - -	64 "
16	"	"	"	"	"	- - -	256 "

Of course the same rule applies to the force of natural currents acting upon vessels; that is, it requires four times as much power to stem a current of two miles per hour as it does to stem a current of one mile, and so on, as above stated. From this it will be seen what a vast saving of propelling power is secured by slowness of movement. We see this practically exemplified on the Hudson river, where from twenty to forty heavy barges, schooners, sloops and canal boats are often attached to a single tow-boat, and the whole fleet creeps along at the rate of from two to five miles an hour, according to the state of the tide. Thousands of tons are thus propelled by a single engine at extremely low rates. Now let the Ohio be converted into a deep slackwater, and we should witness the same thing upon it, especially during low water. In fact, freights could be carried cheaper at such times than during high water; because, owing to the gentleness of the current, tow-boats could carry almost any quantity of barges or canal boats either up or down. It is not an extravagant estimate to put the aggregate saving of propelling power at an amount more than sufficient to yield a handsome remunerating dividend upon the cost of the improvement

But other most important advantages to proprietors of boats would be gained. Their boats would not then, as now, be compelled to lie idle during most of the summer and fall months for want of water. Neither would they be obliged, as they now frequently are, to start with half a load, and grind the bottoms of their boats at that. Neither would they be liable to stick on bars and ripples, often at great expense and damage. These advantages, in which the whole business community would share

with them, would render steam boats a more safe and desirable species of property; and if from the reductions of the rates of freight, they should clear less on a single trip than they sometimes now do, their earnings would amount to more in the course of the year. But it may be safely assumed that a sure navigation, and a uniform tariff of rates, would bring a three-fold greater amount of trade to the river than would ever seek it were things to remain as they are.

THE COAL TRADE.

It is but a few years since coal in any considerable quantity began to be shipped down the Ohio from the region around Pittsburgh; but now the shipments reach millions of bushels annually, and the quantity is rapidly increasing, and must continue to increase indefinitely. The region to be supplied is capable of sustaining many millions of people, and is increasing in population at a ratio that has no parallel in any other country. To pretend to estimate the quantity of coal that the people of such a region will require, both for domestic and manufacturing purposes, would be folly. Suffice it to say, that in twenty years it must exceed what is carried on any other channel of conveyance in this country, or perhaps in the world. The supply is inexhaustible. The Monongahela, Youghiogheny, Allegheny, and the upper Ohio itself, all traverse one vast coal field, and every tributary, every ravine, may be made to pour its tribute into this great central artery. So much as to the supply and demand.

The usual method of carrying coal to the lower markets at present is to load it into square, flat-bottomed boats, generally a little over 100 feet long by 16 to 20 wide, and about 6 deep, known by the various appellations of arks, flat-boats, and "broad-horns." One of these boats will carry from 8,000 to 10,000 bushels, or from 280 to 330 tons. They are run in couples; and from twelve to fifteen men are required to manage them. They are rigged with several pairs of sweeps to urge them forward, and steering sweeps fore and aft, to keep them in the channel. But in spite of all these, they are often stranded and lost; and the loss of the boat is not unfrequently attended with loss of life. It is only in times of high water that these boats can run at all; and then too much coal is often thrown upon the market at once, to the great inconvenience of wholesale purchasers, and often to the serious detriment of the shippers. Never, perhaps, was there a great trade carried on more irregularly and fitfully. All parties suffer. Sometimes there is so much coal at the wharves of the larger cities on the lower Ohio that purchasers cannot be found for it; at other times the supply is almost exhausted. In the course of a single season the price of coal in Cincinnati has varied from 10 to 40 cents per bushel. These boats are never brought back.

Latterly, however, barges are coming into use. They are about 100 feet long, 16 wide, and 5 deep. One end has a long and easy rake, the other is square. When ready to go out, two of them are coupled together by the square ends, thus forming one long double boat, having a rake at both ends. They are thus attached to steam tow-boats and taken down the river; and when the cargoes are discharged, they are towed back. This, in the present condition of the river, requires a large expenditure of power, owing to the numerous rapids they have to contend with. These, too, require high water; but not quite so much as the "broad horns."

Were the river converted into a slackwater navigation, these barges would be the very thing; and then low water would be better than high water; because a tow boat could govern downwards or tow back five times as many as it now can. And, what is still more important, the trade could be prosecuted with safety and regularity; and much less capital would be needed in proportion to the amount of business done. Were it possible to estimate the advantages that would accrue to the immense population directly interested in this article of prime necessity, both producers and consumers, in rendering its transit regular, steady, safe and cheap, there is little doubt that they would be found great enough to warrant the expenditure, even if no other interest were to be beneficially affected.

ICE.

Upon the setting in of cold weather, large quantities of ice form and float down the Allegheny and Ohio rivers. As the water falls and the ice increases, it grounds upon shoals and bars, and against the shores, and continues to accumulate until "the river closes," to use a popular phrase. Whatever floating ice comes down afterwards, lodges against the barriers thus formed, and in this way the river often becomes filled with ice in heavy, confused and irregular masses, far exceeding in thickness what would form upon still pools. Before it gorges, it is often so heavy as to put a stop to navigation for several days; and afterwards all navigation is suspended until it breaks up and runs off.

On the Monongahela slackwater the case is altogether different. The pools become sheeted over like ponds. There are are no floating or moving masses of ice; and it is easy to keep a channel for boats open during the continuance of frosts that fill the Allegheny and uppor Ohio with ice. J. K. Moorhead, Esq., states that for several consecutive years the average interruption of navigation from this cause was only 15½ days. The Ohio, if converted into a series of pools, would be affected by frost just as the Monongahela is; and as the business upon it would be vastly

greater, the frequency of the passage of boats would keep an open channel all winter, and the only interruption would be the running off of the ice after breaking up. The quantity of ice would be far less than now forms by aggregation; for when water is once covered with a sheet of ice, and that generally with more or less snow, congelation goes on very slowly, compared with what takes place on water fully exposed to a frosty atmosphere. It seems paradoxical, at first view, that less ice shou d form upon a slow moving stream than upon a rapid one; but a little reflection will convince any one that it is so. So far, therefore, as ice is concerned, we may confidently expect that it will not occasion one half the obstruction to navigation, when the river shall be converted into a slackwater, that it now does.

PITTSBURGH AND THE FIRST DAM.

Much inconvenience is experienced at Pittsburgh for want of greater depth of water during most of the year. The channel of the Monongahela along the levee has a pretty good depth, but it is narrow during low water. The Allegheny is shoal and the current strong—too strong for the advantageous use of tow boats. A dam that would raise the water eight feet at McKee's Rocks, two miles below the city, would swell it at least six feet on both sides of the city, backing the Monongahela against dam No. 1 of the slackwater, and rendering the Allegheny a slackwater of good depth to some distance above Sharpsburg. What a magnificent harbor for the commerce of the three rivers would such a pool afford! It would be worth more to that city than would pay for three such dams.

COST, ETC.

The length of the Ohio is, say, one thousand miles. It follows, therefore, that the improvement will cost as many thousands per mile as the entire work will cost millions. Men better qualified to judge of such matters than the writer, have estimated the expense at from seven to ten millions of dollars. This gives from seven to ten thousand dollars per mile—about half the expense of an ordinary canal, or about one-third the average cost of a railroad. Now as it will be of ten times the capacity of either, and probably accommodate ten times the amount of business that a reasonably profitable canal has to do, it follows that the tolls need not be one-tenth as much as those assessed upon the tonnage of ordinary canals. The tax upon the business of the river may therefore be very light, and yet the work pay good dividends upon the stock. On a work of such magnitude we can only arrive at proximate estimates of what the tariff of tolls ought to be to make it pay, by comparing it with similar

works already existing, both in reference to its length, its relative cost, and the probable amount of its business. But the less the tax laid upon the commerce of the river, the better for the country at large. The consumer of coal in Cincinnati, Louisville, Memphis, or New Orleans, and the consumer of flour in Pittsburgh, Baltimore, Philadelphia, New York or Boston, will both be benefitted by such policy; and when it can be shown that a large majority of the American people will participate in the benefits of the improvement, surely we may confidently ask Congress for a donation equal to at least one-third the cost of the work, not to swell the dividends of stockholders, but to enable the company to make the navigation almost free. I say a *donation*, because I believe it is not at all desirable that the general government, or even the State governments, should become shareholders, and be participants in its management, except by the enactment of laws necessary to the regulation and control of the corporation. Experience has taught us that public works, under National or State management, are not only unprofitable, but demoralizing and dangerous. Far better that the work should be done solely by individual effort, than that it should become an arena for the struggles and trickery of politicians and place-hunters. But let Congress give as much to this work as it gave to the Illinois Central Railroad—and that was a clear donation—and it will soon be accomplished.

To the Pittsburgh Board of Trade.

GENTLEMEN: As you are pleased to give publicity to my former communications, I beg leave to offer a few additional facts and thoughts.

EXPENSE OF REPAIRS, AS COMPARED WITH RAILROADS.

In order to show the relative expense of keeping such a work as the Ohio slack-water in repair, as compared with that required for a first class railroad, I subjoin, in parallel columns, the annual cost of keeping the Monongahela Slackwater and the Reading Railroad in repair during periods of eleven years and ten years, respectively; merely premising that the amount given for repairs on the Reading Railroad are exclusively for keeping the roadway in good order; and include none of the cost of keeping up the rolling stock, or operating the road. The length of the former is 55 miles; of the latter, 95.

	Mon. Nav.	Reading R. R.
1845	$1,118 78	121,228 00
1846	7,770 68	142.968 00
1847	2,141 49	132,780 00
1848	2,854 25	143,384 00
1849	4,257 32	140,990 00
1850	3,428 52	154,780 00
1851	4,696 92	160,569 00
1852	11,450 09	202,132 00
1853	3,629 11	178,480 00
1854	2,128 42	220,210 00
1855	1,245 53	

	Mon. Nav.	Reading R. R.
Average expense per annum,	$4065 92	$159,752 00
Average yearly expense per mile,	73 93	1,671 60

Both these improvements are principally used for carrying coal; yet we see that the expense of keeping the Railroad in repair was more than *twenty-two and a half times* as heavy per mile as that incurred upon the Monongahela slackwater. The works of the latter are now in as good order as they ever were. The timber used in the dams shows no signs of decay; and for many years to come the amount of expenses for repairs

is not likely to be increased. The floods of the river keep the channel clear; so that the heavy expense incurred upon artificial canals, for keeping them at a proper depth, is here avoided.

This exhibit shows us how it is that the Monongahela navigation has paid handsome dividends to the stockholders at very low rates of toll. In fact, nearly all its earnings are clear proffit; and so would the earnings of the proposed Ohio improvement be.

A SUPPOSED DIFFICULTY.

Apprehension has been felt and expressed by some persons, that in time these pools will fill up more or less with sand and mud, and the channel be rendered too shoal for navigation; but these fears are groundless. In my communication of March last, this apprehended difficulty is incidentally met, in that part where I speak of the effect of the proposed dams on high freshets. On the Ohio, the inclined plane will be restored whenever the water rises to a heighth of about 16 feet above the ordinary low water line; and that being the case, the velocity of the current will be the same as if no dams existed; for the water will be urged onward, in obedience to the law of gravity, with all the speed due to the natural fall of the river, just as it now is. This being so, its power to sweep its pools will be unimpaired, and consequently the debris cannot be deposited any more than it is now. In their natural condition the Allegheny and Ohio are but a long series of alternate *dams* and pools—the ripples, as we call them, being nothing else than natural dams. The intervening pools or "eddies,' as they are generally though improperly termed, are frequently thirty feet deep at the lowest water; yet the floods sweep them out, and they indicate no appearance of filling up.

It is only on streams so small that no floods can ever restore the inclined planes broken by dams that we find pools filled up with debris. They never rise sufficiently high to restore the original velocity of the water in the portions of their channels occupied by these artificial pools; the consequence is that whatever sand and mud are carried down from above are deposited in this slack water, and remain there. In time the channel becomes so contracted, both in breadth and depth, that the stream in times of freshets, acquires its original velocity. After that no more sediment is permanently deposited.

The Monongahela pools furnish a confirmation of the truth of the position here taken.

Very respectfully,

JOSIAH COPLEY.

Jan. 15, 1856.